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(21) International Application Number: PCT/GB99/01137 (22) International Filing Date: 14 April 1999 (14.04.99) (30) Priority Data: 9807665.6 14 April 1998 (14.04.98) GB (71) Applicant (for all designated States except US): AGRISENSE-BCS LIMITED [GB/GB]; Treforest Industrial Estate, Pontypridd CF37 5SU (GB). (72) Inventors; and (75) Inventors/Applicants (for US only): JONES, Owen [GB/GB]; The Brox, 68 Mill Road, Lisvane, Cardiff CF4 5XG (GB). LISK, Jennifer, Carol [GB/GB]; The Brox, 68 Mill Road, Lisvane, Cardiff CF4 5XG (GB). (74) Agent: AUSTIN, Hedley, William; Urquhart-Dykes & Lord, Alexandra House, 1 Alexandra Road, Swansea SA1 5ED (GB).		(81) Designated States: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG). Published <i>With international search report.</i>
(54) Title: INSECT ATTRACTING DEVICE (57) Abstract Apparatus for attracting insects which includes insect trapping means, a body containing at least one evaporatable insect attractive compound for sustained release therefrom, and heating means arranged for heating the body when the latter is in or near said trapping means.		

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Insect Attracting Device

5 The present invention is concerned with a device for attracting insects and the like.

10 As the world's population grows, much attention has been paid to methods of increasing the food supply. One element in such methods is the prevention of post-harvest losses resulting from the activities of insects and other pests during storage of foodstuffs. In addition to rendering the food unavailable in times of shortage, the activities of such pests result in economic loss associated with the presence of contaminants such as live and dead insects.

15 The traditional technique for control of pests (such as houseflies or the like) has been by the application of insecticides. Such insecticides are typically in the form of residual treatment and space sprays. The housefly (like other insects) has, however, developed high levels of resistance to many of the major groups of insecticides. Alternative means of control are therefore being sought.

20 In order for an insect control to be effective, it needs to rely on non-chemical means or on strategies which incorporate limited insecticide use and minimise the selection for resistance.

30 It is known to provide traps for the monitoring, study and control of flying insects. Such traps are of various designs and may be, for example, tent-shaped, plain strips

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of card and the like, or closed tubs having at their upper end a funnel shaped entrance area which permits entry of the insect into the tub but which prevents escape of a trapped insect therefrom.

5

It is known in the art that the addition of attractants to various traps can increase the efficiency of the trap. However, there is a fundamental problem with such an approach, which is that because many attractants have relatively large molecules, with a carbon chain of 16 or more (for example, the pheromone for the common housefly is tricosene which has the chemical formula $C_{23}H_{46}$), the attractants have a very low volatility. The range over which an insect can detect and respond to such non-volatile attractants is therefore limited.

15

It is therefore an aim of the present invention to provide an improved method and apparatus for attracting insects and the like.

20

According to a first aspect of the present invention, there is provided apparatus for attracting insects, which apparatus includes insect trapping means, a body containing at least one evaporatable insect attractive compound for sustained release therefrom, and heating means arranged for heating the body when the latter is in or near said trapping means.

25

The at least one insect attractive compound preferably has from 16 to 30 carbon atoms. Typically such compounds have melting temperatures at or above ambient temperature. A

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preferred such compound is a pheromone. When the insect is the common housefly, such a pheromone preferably comprises Z-9-tricosene.

5 The heating means is preferably arranged to be set at a temperature of about 70 degrees Celsius. For example, the heating means is preferably provided with a thermostat arranged to ensure that the heating means is maintained within five degrees Celsius of a predetermined temperature
10 (such as about 70 degrees Celsius).

The heating means is preferably arranged to be electrically heated, and may, for example, be mains power operated or battery operated. Such heating means preferably comprise
15 a heating element provided in or on an opaque thermally resistant matrix, and means for connecting said heating element to a power supply. However, when the apparatus is to be used in the field, it is preferred that the power supply is an electrical battery.

20

The sustained release formulation is preferably positioned in close proximity to the heating means so as to enhance evaporative release of the at least one attractant.

25 The trapping means may be for example, tent-shaped, plain strips of card or the like, or a closed tub having at its upper end a funnel shaped entrance area which permits entry of one or more insects into the tub but prevents the escape of insects therefrom. Examples of suitable such trapping
30 means are described in GB-A-2052942; other suitable trapping means are described in US-A-5170583.

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The heating means is preferably positioned within the interior of such a tub, more preferably at the upper end of the tub close to the funnel.

5 It is preferred that the apparatus is used in the presence of light; if the apparatus is intended to be used in the absence of natural light, the apparatus may further include a light source, such as an electrical bulb or the like.

10 According to a second aspect of the invention there is provided a method of attracting insects which method includes providing apparatus according to the invention, and heating the formulation using said heating means so as to permit release of said attractant therefrom.

15 It is preferred that the at least one attractant is heated to within about five degrees Celsius of a predetermined temperature, such as about 70 degrees Celsius.

20 Preferred features of the invention will now be described, by way of illustration only, with reference to the accompanying drawings, in which:

25 Figure 1 is a side elevation of exemplary apparatus according to the invention;

Figure 2 is a plan view of the underside of the cover member of the apparatus of Figure 1; and

30 Figure 3 shows an arrangement of several traps according to the invention, when in use in trials described in the

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following Examples.

Referring to Figure 1, there is shown an insect trap generally designated 1, the trap having an insect-receiving tub 2 with a liner 3 of sticky sheet material. Covering the open end 4 of tub 2 is a removable funnel 5. The funnel includes a skirt portion 6 which is removably attached to the tub by a screw thread (not shown) or the like, an upwardly extending curved portion 7, and a downwardly extending constricted tubular portion 8 for which the narrow end 9 extends into the interior of the tub 2. Mounted to the curved portion are a series of legs 10 which support a concave cover 11, having on an upper face, a series of hanging lugs 12.

To the underside of cover 11 is secured a battery operable heater 13, and adjacent thereto, a lure pad containing a sustained release material for release of an insect-attractive compound as indicated above. Also secured to the underside of cover 11 is a light sensor (see Figure 2).

In use, the heater 13 is activated and thermostatically controlled to permit sustained release of insect attractant from the insect-attractive compound.

The invention may be more clearly understood from the following illustrative examples, in which reference is made to Figure 3 of the accompanying drawing:

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Example 1: Field Trials

5 The field trials took place at a poultry farm which had a number of sheds each housing battery chickens. Houseflies are common pests at such sites, because they breed in putrefying matter, and can develop in large numbers in poultry manure under the caged hens. Experiments were carried out in two chicken sheds.

10 In both chicken sheds, funnel-type test traps as described above with reference to Figures 1 and 2 were suspended from the ceiling. The traps had heaters either incorporated in the underside of the cover member, as described above with reference to Figures 1 and 2, or in
15 the base of the tub.

Each trap had a pheromone-releasing lure held in place on a heater pad by cross-wires. Each lure consisted of 400mg tricosene dosed onto cellulose board 25mm x 50mm in size.

20 The four traps in this experiment were set up as follows:

Trap 1: no power, heater in base of funnel.

Trap 2: no power, heater in lid of funnel.

Trap 3: with power, heater in base.

Trap 4: with power, heater in lid of funnel.

25 The heater pads in the traps were set to run at 70°C.

The results of the experiments are gauged by the number of flies caught on each day. The results are as follows:

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	Trap 1	Trap 2	Trap 3	Trap 4
Day 1	5	47	500+	135
Day 2	1	52	94	57
5 Day 3	18	232	395	676
Day 4	31	267	780	880
Day 5	40	46	175	432

10 It can be seen from the results that the traps which had
heated pads caught significantly more flies than the traps
which did not have heated pads. In addition, it can be
seen that more flies were trapped if a heated pad was in
the lid of the funnel, presumably because in this location
15 the pheromone is allowed to circulate more freely.

Example 2: Laboratory Trials

20 The laboratory trials took place in a controllable
environment. The test chambers were large enough to
accommodate four funnel traps; the arrangement of the traps
being illustrated in Figure 3. The traps were suspended
from two lines running across the room at approximately 1.8
25 metres above the floor.

Houseflies were supplied as pupae and were kept in a mesh
cage until emergence. A new group of flies were released
into the room and allowed to fly freely for the duration of
30 each test. After this time, the number of flies caught in
each trap was counted.

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With reference to the following tables, H represents heat present in the trap, L represents light present in the trap and P represents pheromone present in the trap.

5 **Series 1:**

Series 1 was designed to determine the influence of light on the number of flies caught in the traps.

Day 6

10	Trap	Parameter	Count	Trap	Parameter	Count
	FL	H	2	FR	Blank	2
	NL	Blank	0	NR	H	9
	FL	Blank	2	FR	H	1
	NL	H	7	NR	Blank	1

15

Very low numbers were caught in spite of the release of large number of flies.

20 **Day 7**

Trap	Parameter	Count	Trap	Parameter	Count
FL	H	8	FR	L	99
NL	L	63	NR	H	23

25

Traps with light only were more attractive than traps with heat only, but the combination of heat and light was most effective.

30

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Day 8

Trap	Parameter	Count	Trap	Parameter	Count
FL	H	9	FR	HL	122
NL	HL	88	NR	H	35

5

Day 9

Trap	Parameter	Count	Trap	Parameter	Count
FL	P	3	FR	Blank	2
NL	Blank	0	NR	P	9

10

Day 10

Trap	Parameter	Count	Trap	Parameter	Count
FL	PL	29	FR	Blank	2
NL	Blank	0	NR	PL	51

15

Day 11

Trap	Parameter	Count	Trap	Parameter	Count
FL	Blank	7	FR	PL	94
NL	PL	66	NR	Blank	1

20

25 The presence of light and pheromone-releasing body resulted in increased trap catch. Traps with pheromone-releasing body plus light caught almost 100% of the flies in the room.

30 The first two tests (day 6) show that with no light in the room, and no pheromone either, the catches in all of the

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traps were very low, in spite of there being approximately 100 flies released into the room. The data from day 8 shows that a combination of heat and light was more attractive than heat alone. The combination of heat and light does not appear to be more attractive than heat alone, indicating that, in the absence of pheromone, it is only the light which has any influence on the trap catch.

Series 2:

The previous results indicated that trap catches are greater in the presence of light; therefore, tests in series 2 were carried out in the presence of light. The test results were as follows:

Traps were set up again when a new supply of houseflies were available. Room lights on for the next 2 tests.

Day 12

Trap	Parameter	Count	Trap	Parameter	Count
FL	PH	19	FR	P	34
NL	P	3	NR	PH	39

Day 13

Trap	Parameter	Count	Trap	Parameter	Count
FL	P	10	FR	PH	46
NL	PH	25	NR	P	8

On day 13 the room light was switched off. The light remained switched off for the next test

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Day 14

Trap	Parameter	Count	Trap	Parameter	Count
FL	P	1	FR	PH	11
NL	PH	9	NR	P	2

5

With no light in room the trap catch is very low, but the heated pheromone still attracted more flies than the unheated lures.

10 The light was switched back on for a repeat of day 13 test

Day 15

Trap	Parameter	Count	Trap	Parameter	Count
FL	PH	10	FR	P	13
NL	P	3	NR	PH	24

15

20 A pheromone pad was present in every trap. In the first two tests, the traps with heated pheromone caught significantly more flies than the traps without heat. On day 12, the pheromone and heat traps caught 61% of the total catch and on day 13, they caught 80%.

25 The room light was switched off for day 14 and the results show that the catch dropped dramatically, confirming the need for light before the flies respond to other factors. In dark conditions, however, the data shows that 90% of flies are caught in the traps where the pheromone was heated.

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Claims:

1. Apparatus for attracting insects, which apparatus includes insect trapping means, a body containing at least one evaporatable insect attractive compound for sustained release from said body, and heating means arranged for heating the body when the latter is in or near said trapping means.
2. Apparatus according to claim 1, wherein the insect attractive compound has from 16 to 30 carbon atoms.
3. Apparatus according to claim 1 or 2, wherein the insect attractive compound has a melting temperature at or above ambient temperature.
4. Apparatus according to any of claims 1 to 3, wherein the insect attractive compound is a pheromone.
5. Apparatus according to any of claims 1 to 4, wherein the insect is the housefly.
6. Apparatus according to claim 5, wherein the insect attractive compound includes Z-9-tricosene.
7. Apparatus according to any of claims 1 to 6, wherein said heating means is provided with a thermostat arranged to ensure that the heating means can be maintained in a predetermined temperature range.

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8. Apparatus according to claim 7, wherein the temperature range is from about 65°C to 75°C.

5 9. Apparatus according to any of claims 1 to 8, wherein the heating means is arranged to be electrically heated.

10 10. Apparatus according to claim 9, wherein the heating means is provided with mains power or battery electrical supply.

15 11. Apparatus according to any of claims 1 to 10, wherein said heating means comprises a heating element provided in or on an opaque thermally resistant matrix, and means for connecting the heating element to a power supply.

20 12. Apparatus according to any of claims 1 to 11, wherein the insect attractive compound is in close proximity to the heating means.

25 13. Apparatus according to any of claims 1 to 12, wherein the trapping means is tent shaped, plain strips of card or the like.

30 14. Apparatus according to any of claims 1 to 12, wherein the trapping means is a closed tub having a funnel shaped entrance at an upper end which permits entry of one or more insects into the tub but substantially prevents the escape of insects therefrom.

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15. Apparatus according to claim 14, wherein the heating means is within the interior of the tub.
- 5 16. Apparatus according to claim 15, wherein the heating means is at the upper end of the tub.
17. Apparatus according to any of claims 1 to 16, which further includes a light source, such as an electrical bulb.
- 10 18. A method of attracting insects which includes:
- i) providing apparatus according to any of claims 1 to 17; and
 - 15 ii) heating the formulation using the heating means so as to permit release of the insect attractive compound therefrom.

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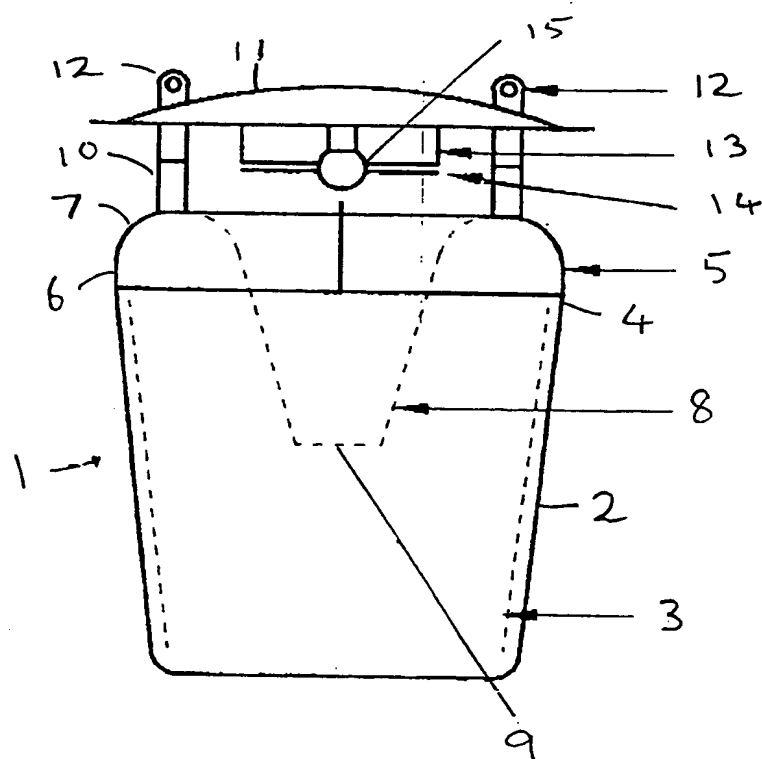


FIGURE 1

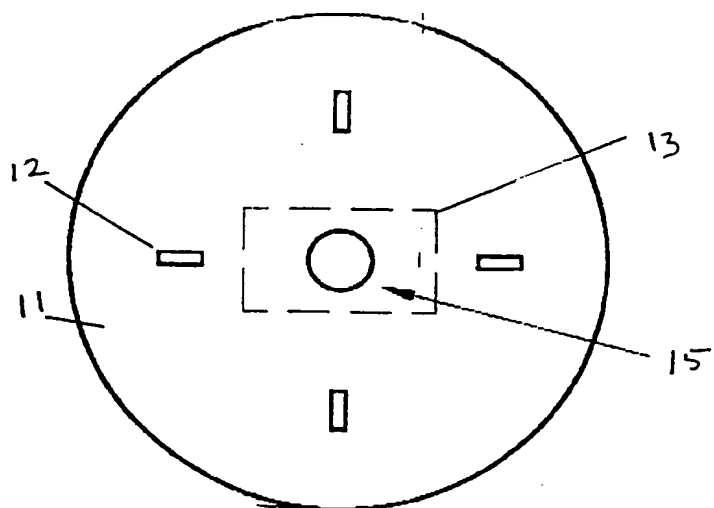
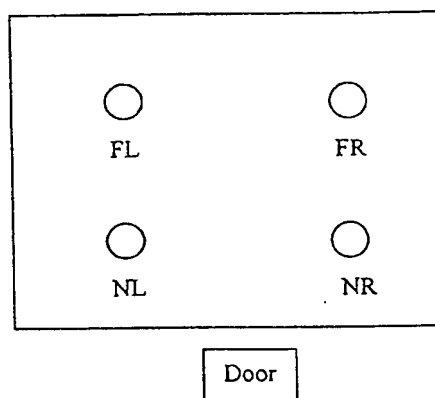


FIGURE 2

FIGURE 3

FL (far left)
NL (near left)

FR (far right)
NR (near right)



INTERNATIONAL SEARCH REPORT

International Application No
PCT/GB 99/01137

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 A01M1/02 A01M1/10

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 A01M

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4 283 878 A (HILL ALISTAIR C ET AL) 18 August 1981 (1981-08-18)	1-6,9, 10,12, 14,15,18
A	column 1, line 15 - column 2, line 65 column 3, line 13 - line 63 column 4, line 16 - line 62 claims; figures	11
X	US 5 184 417 A (WELDON CHERYL D) 9 February 1993 (1993-02-09)	1,9,10, 12,15, 17,18
	column 1, line 31 - column 2, line 16 claims; figures	



Further documents are listed in the continuation of box C.



Patent family members are listed in annex.

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INTERNATIONAL SEARCH REPORT

International Application No

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category	Citation of document, with indication where appropriate, of the relevant passages	Relevant to claim No.
A	<p>EP 0 547 828 A (AGRISENSE BCS LTD) 23 June 1993 (1993-06-23) page 2, line 52 - line 56 page 3, line 29 - page 4, line 22 claims; figures</p> <p style="text-align: center;">---</p>	1,2,6,18
A	<p>GB 2 052 942 A (UNILEVER LTD) 4 February 1981 (1981-02-04) cited in the application claims; figures</p> <p style="text-align: center;">---</p>	1,13
A	<p>US 5 170 583 A (COAKER THOMAS H ET AL) 15 December 1992 (1992-12-15) cited in the application</p> <p style="text-align: center;">-----</p>	1

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

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